

Galaxias “southern” (southern flathead galaxias) habitat description



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Cover: *Galaxias* “southern” habitat, Mataura River. Photo by Nicholas Dunn

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Abstract

Galaxias “southern” occupy habitats typified by loose cobble substratum at the upstream end of riffles created by chute channels in braided riverscapes. These habitats are vulnerable to water abstraction and gravel extraction which can lead to sedimentation and stabilisation of the substrate, and channelisation due to invasive macrophytes and woody weeds.

1. Introduction



Figure 1. *Galaxias* “southern” (southern flathead galaxias). Photo by Rod Morris.

Galaxias “southern” (southern flathead galaxias; Figure 1) is an iteroparous, spring spawning, non-diadromous taxon widely distributed in Southland, with further sub-populations in Otago, on South and Stewart islands. *Galaxias* “southern” has a highly fragmented distribution, including stream and braided river habitat types scattered across the Clutha, Mataura, Oreti, Freshwater, Rakeahua, Aparima and Waiiau river catchments, and a tributary stream of Waikawa Harbour (Figure 2). *Galaxias* “southern” has a conservation status of Threatened: Nationally Vulnerable (Dunn et al. 2018).

Qualitative habitat descriptions based on field observations and measurements are given for *Galaxias* “southern”, complimenting quantitative descriptions following Instream Flow Incremental Methodology (IFIM) assessments of Sinton et al. (2016, 2021). Descriptions are designed to typify the range of instream habitat conditions adult *Galaxias* “southern” occur in, at a mesohabitat scale.

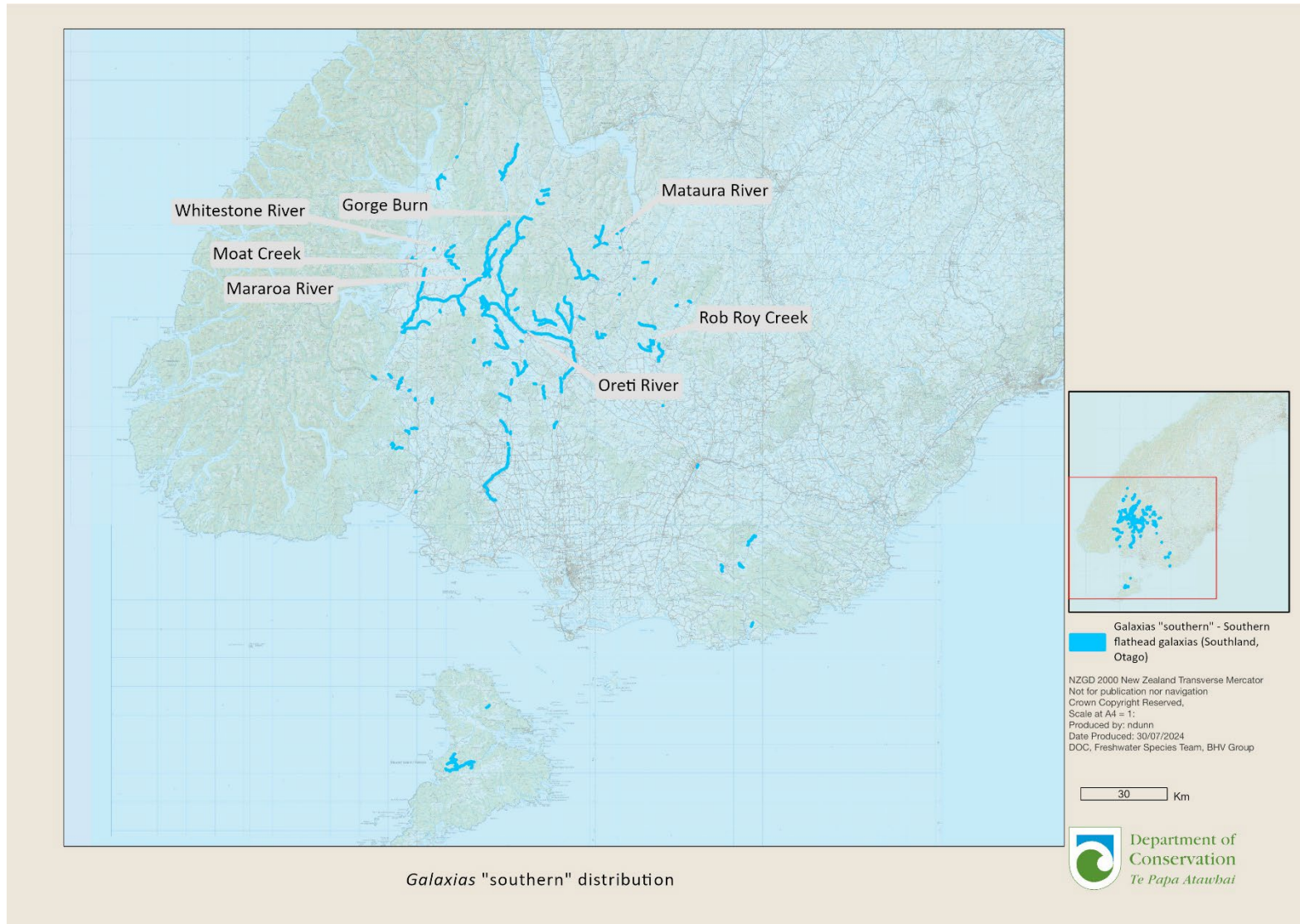


Figure 2. Known *Galaxias* “southern” habitat fragment distribution with sites included in the habitat studies indicated.

2. Methods

One site on each of Moat Creek, and the Mataura and Oreti rivers were sampled in November 2020 (Table 1), being the same sites as those reported on by Sinton et al. (2021). Further sites on Gorge Burn, Rob Roy Creek, and the Whitestone and Mararoa rivers reported on by Sinton et al. (2016) are not reported on from a qualitative perspective here. Site selection was based on *Galaxias* “southern” being previously known at these locations, with sampling timing designed to coincide with the summer low flow period, and to not interfere with spawning and larvae/post-larval/juvenile rearing periods.

Table 1. Location of study areas for *Galaxias* “southern” in Moat Creek and the Mataura and Ōreti Rivers. Coordinates are for the midpoint of sampled reaches.

Waterbody	NZTM Easting	NZTM Northing
Moat Creek	1201388	4957681
Mataura River	1254246	4963801
Oreti River	1228458	4932907

In each waterbody a sampling reach containing a variety of instream habitat types was selected. Starting at the downstream end of reaches, transects were marked at 3.0 m intervals. Within each transect a 0.75 m x 0.75 m quadrat was carefully placed within the stream to cover the dominant flow, water depth and substrata conditions. A 1.0 m wide push net was placed along the downstream edge of the quadrat and three-pass electrofishing of the quadrat was conducted using a Kainga EFM 300 backpack electrofishing machine (NIWA Instrument Systems, Christchurch). Each pass consisted of 5 seconds of electrofishing time in a downstream direction, stopping for a minimum of 5 seconds between passes. Captured fish were identified to taxon and measured to the nearest 0.5 mm Total Length, then placed in an aerated bucket of water to recover before being released.

Locations of quadrats were recorded by GPS and water depth and velocity measured at the centre points of quadrats. Water velocity was measured at 0.6 x depth using a Marsh McBirney Flo-Mate 2000 electromagnetic current meter. Percentage substratum composition was estimated within the quadrat using modified Wentworth scale size classes: bedrock (>4096 mm), boulder (256-4096 mm), cobble (64-256 mm), large gravel (8-64 mm), fine gravel (2-8 mm), sand (0.06-2 mm) and silt (0.0063 mm). Percentages of algal and macrophyte cover within the quadrat were also estimated.



Figure 2. *Galaxias* “southern” habitat. (A) transverse bar chute channels. (B) complex riffle and side bar. (C) riffle head and upstream run. (D) riffle head and upstream run. (E) riffle edge backwaters. (F) detail of riffle edge steps and backwaters.

3. Results

A total of 90 quadrats were sampled across the three waterbodies, with *Galaxias* “southern” captured in 46 of these. There was large variation in catch rates of *Galaxias* “southern” in each waterbody, with 31 in Moat Creek, 12 in the Ōreti River and only 3 in the Mataura River. Characteristics of the sites *Galaxias* “southern” were present at are summarised in Table 2.

Galaxias “southern” showed a strong preference for mid-sized substrates and were almost exclusively found in quadrats where the dominant substrate class was large gravels or cobbles (Sinton et al. 2021, Table 2). *Galaxias* “southern” had a strong preference for riffle or run habitat types.

Table 2. Habitat attributes measured within the 46 quadrats where *Galaxias* “southern” were present. Units are as presented, and percentages were visually estimated.

Attribute	Mean	Range (min – max)
Stream width (m)	5.1	1.37 – 21.7
Flow velocity (ms ⁻¹)	0.4	0.01 – 1.01
Substrata size class (mm)	64 – 256 ¹	8 – <4096 ²
Water depth (cm)	12.4	7 – 23.5
Riffle habitat (%)	49.9	0 – 100
Run habitat (%)	43.5	0 – 100
Pool habitat (%)	6.63	0–95

¹ Cobble

² Large gravel - boulder

4. Discussion

Based on field measures and observations, *Galaxias* “southern” typically occur in habitats characterised by larger discharge, wider, higher Strahler Order, multi-channel braided gravel-bed rivers with long riffle – run units and complex channel bars within broad valleys. At the mesoscale *Galaxias* “southern” habitat is characterised as being at the head of steeper run-riffle-rapid sequences with large gravel - cobble – boulder substratum in fast, deep water. Substratum is loosely packed resulting in large interstitial spaces affording cover. Moreover, on the lateral edges of larger riffle-rapid units, such larger substratum particles can create steps with associated lower velocity backwater units.

There is typically an absence of aquatic macrophytes in *Galaxias* “southern” habitats, and algal communities are typified as thin films, due to the high

frequency of bed moving flows, however during long periods of reduced flows, profuse medium thickness brown algal mats may develop.

Habitats of *Galaxias* “southern” can be impacted by water abstraction reducing flows, making them vulnerable to sedimentation and when in combination with gravel extraction. These activities can result in a reduction in particle size and embeddedness of particles, resulting in a loss of interstitial spaces. Encroachment of habitat by invasive macrophytes can cause channelisation and substratum stabilisation.

5. Acknowledgements

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6. References

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